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Discussion

Dr Leonard N. Girardi *(New York, NY).* I congratulate Dr LaPar for an excellent presentation and the University of Virginia group for outstanding results in a patient population that we are all seeing more of, those with previous cardiac surgery now requiring AVR. The 2% mortality in their last 100 cases is truly remarkable, actually lower than their mortality among patients undergoing primary AVR. To help us to learn more from their experience and perhaps incorporate some of their experiences and recommendations into our own practice, I have a few questions.

Dr LaPar, you were correct in assigning some of the credit for this improvement in mortality with time to improved surgical technique and a larger hospital experience with this patient population. The patients in the last era, however, about the last 100 patients, actually had better New York Heart Association functional class, had higher ejection fraction, underwent fewer urgent operations, and underwent fewer concomitant mitral valve and CABG procedures at the time of reoperative AVR. So, are we truly technically better than we were in a previous era, or are we just better at getting patients to the operating room earlier? That would include educating our cardiology counterparts in getting patients to the operating room earlier. Also, once we get them to the operating room, are we a little smarter not so much in how we do the operation technically but perhaps in what we don't do to the mitral valve and to the coronaries, to cut down on the increased crossclamp and bypass times that so significantly contributed to mortality in your series?

Dr LaPar. Dr Girardi, thank you for the feedback and those insightful questions. Certainly, patient selection is fundamental in improving operative outcomes and mortality. In this study, we believe that the trends that we had seen in declining operative mortality and outcomes are likely related to a combination of several factors. As you mentioned, we performed significantly more reoperative AVRs in the most recent era. We believe that as we do more surgery, we are getting better. In addition, the change in our surgical technique to include a minimal dissection of the heart has contributed to shorter aortic crossclamping and cardiopulmonary bypass times. We feel that these effects are significant in our results. We also, in the most recent times, have obtained more preoperative computed tomographic angiograms to help us to define vein graft anatomy better, as well as cardiac and mediastinal anatomy, and we believe that this may help in that patient selection and also in our operative planning. Finally, improvements in cardiac anesthesia and postoperative care with time have likely resulted in benefits for all cardiac operations.

With respect to preoperative risk, you mentioned ejection fraction and New York Heart Association functional class. We primarily thought to evaluate preoperative risk with EuroSCORE, and we did find higher EuroSCOREs in the most recent operative era. We consider higher EuroSCOREs to be representative of a sicker and older population in the most recent era. To rule out the effects of concomitant operations, we thought it was important to look at the isolated reoperative AVR group. We showed nearly identical trends and improved mortality within that group as well.

Dr Girardi. Second, and finally, if open reoperative AVR is to remain competitive with the less invasive approaches that we heard about earlier today, transapical and transfemoral AVR, especially in reoperations where they may actually have some obvious benefits, we have to continue to work on reducing the morbidity and mortality. The number one cause of mortality in your series was bleeding and post operative tamponade. Although in the last era you had a remarkable 5% reoperation or reexploration rate for bleeding, 43% of the deaths in this series were from tamponade and bleeding. So how are you handling that? Also, should we actually be a bit more aggressive and liberal about taking patients back for bleeding to avoid those catastrophic consequences of massive transfusion and unrecognized tamponade?

Dr LaPar. We could not agree more. At our institution, we perform early reexploration for all suspected cases of persistent postoperative bleeding or tamponade. Specifically, we perform early reexploration in the intensive care unit with standard operating room equipment, personnel, and procedure. Our philosophy is that early reexploration will prevent further postoperative complications and improve patient outcome. Furthermore, we believe that the higher postoperative bleeding rates of our earlier operative eras is related to more complex dissections in the past.

Dr Anthony L. Estrera *(Houston, Tex).* I congratulate you on a nice presentation. In doing reoperative cardiac surgery, we also apply this minimal dissection, or what I call directed dissection. More than half your cases had previous CABG. So my question is, how did you deal with the patent left internal thoracic artery?

Dr LaPar. Thank you for that question. One of the more recent philosophic changes in our operative techniques is that we do not routinely clamp the internal thoracic artery during reoperations. In fact, we recently published a series looking at this issue and found no difference in outcome or mortality with this technique. In adopting this approach, we have attained equal results while at the same time simplifying the operation and avoiding internal thoracic artery injury.

Dr Sacha Salzberg *(Zurich, Switzerland).* Thank you for this nice presentation. I have a question regarding the technique of cannulation and how that has evolved with time. Have you used axillary cannulation? If so, how has that influenced outcomes and neurologic complications?

Dr LaPar. In this study, we did not specifically evaluate outcomes according to cannulation technique. We routinely use preoperative computed tomographic angiography and intraoperative ultrasonography, however, to survey the ascending aorta to select an appropriate aortic cannulation site. Almost all the cases included in this study involved direct aortic cannulation. For cases in which aortic cannulation is difficult, we favor such approaches as axillary or innominate cannulation.